

This listing of claims will replace all prior versions, and listings, of claims in the application.

**Listing of Claims:**

1. (Currently Amended) A system for searching web pages comprising:  
  
a database for storing connectivity information about the web pages; and  
  
a processor-implemented page-grading engine associated with an approximation matrix  $Q'$ ,  
where  $Q'$  approximates an ideal matrix  $Q$  with respect to the connectivity information; wherein:  
  
the page-grading engine receives as input a personalization description  $v$  describing a set  
of preferences of a particular user from among the web pages and a set of search results  
from among the web pages based on a query from the user, and grades the set of search  
results for the user with respect to  $Q'$  and  $v$  such that  $v$  and the set of search results is  
applied to  $Q$  to result in a page rank for each search result in the set, sorting the set of  
search results by page rank, and returning the sorted set to the user; ~~wherein~~  
  
non-zero entries of a vector indicative of the personalization description  $v$  correspond at  
least to a ~~favorites~~ list of favorite web pages of the user as obtained from a associated  
~~with a user's~~ web browser of the user; and  
  
the page-grading engine grades the web pages as grading objects from an interconnected  
collection of weighted objects by approximating the matrix  $Q$  with respect to a parameter  
 $k$ , by computing a matrix  $U_k$ , computing a matrix  $V_k$ , computing a diagonal matrix  $S$ , and  
defining  $Q'$  as the matrix product  $V_k S U_k^T$ .
2. (Original) The system of claim 1 wherein approximation matrix  $Q'$  is a rank- $k$  matrix  
whose representation comprises a singular value decomposition comprising matrices  $V_k$ ,  $S$  and  
 $U_k^T$  for a parameter  $k$ .

3. (Original) The system of claim 2 wherein  $v$  is a vector and  $Q'$  times  $v$  is an optimal approximation to  $Q$  times  $v$  over all rank- $k$  matrices.

4. (Currently Amended) The system of claim 1 wherein the page-grading engine grades the web pages as ~~A method of grading~~ objects from an interconnected collection of weighted objects, the weights of the objects described by a description  $v$ , and the interconnection of the objects described by a description  $P$ , the page-grading engine ~~method comprising:~~

applying a grading function  $Q'$  to the description  $v$  for the objects to determine a set of grades for the objects;

assigning at least one object the corresponding determined grade for that object; wherein the grading function  $Q'$  approximates an ideal grading function  $Q$ , wherein non-zero entries of a vector indicative of the personalization description  $v$  correspond at least to a favorites list associated with a user's web browser and wherein applying ideal grading function  $Q$  to the description  $v$  produces ideal grades with respect to description  $P$  for every object in the interconnected collection of weighted objects; and

rendering an indication of at least one graded object.

5. (Currently Amended) The ~~method~~ system of claim 4 wherein  $P$ ,  $Q$ , and  $Q'$  are matrices,  $v$  is a vector, and the approximation is a low-rank optimal approximation.

6. (Currently Amended) The ~~method~~ system of claim 5 wherein entry  $P[i,j]$  in matrix  $P$  represents the probability of reaching one object  $i$  from another object  $j$  in one step of a random walk among the weighted objects.

7. (Currently Amended) The ~~method~~ system of claim 6 wherein at each step of the random walk there is a fixed probability  $c$  that the walk will reset, and that the random walk then continues from object  $a$  with probability  $v[a]$ .

8. (Currently Amended) The ~~method~~ system of claim 7 wherein the ideal grade of an object  $b$  is the probability of arriving at object  $b$  at a step of the random walk.

9. (Canceled)

10. (Currently Amended) ~~A method of grading objects from an interconnected collection of weighted objects by approximating a matrix  $Q$  with respect to a parameter  $k$ , comprising:~~

~~computing a matrix  $U_k$ ;~~

~~computing a matrix  $V_k$ ;~~

~~computing a diagonal matrix  $S$ ;~~

~~defining the approximation to  $Q$  as the matrix product  $V_k S U_k^T$ ; and~~

The system of claim 1 wherein:

the page-grading engine further determines ~~determining~~ a grade for at least one of the objects using  $Q'$  ~~the approximation to  $Q$~~ ; wherein the weights of the objects are described by a vector  $v$ , ~~wherein and~~

non-zero entries of the vector  $v$  correspond at least to a favorites list associated with a user's web browser, the interconnection of the objects is described by a matrix  $P$ , and the ideal grade of object  $i$  with respect to matrix  $P$  equals  $Q[i]$  times  $v$  where  $Q[i]$  is the  $i$ th row of an ideal matrix  $Q$ .

11. (Currently Amended) The ~~method~~ system of claim 10 further comprising:
- choosing a sufficiently large parameter  $d$ ; and
- computing an intermediate matrix  $M$  with respect to  $P$ ; wherein matrix  $U_k$ , comprises the  $k$  principal eigenvectors of  $dI - MM^T$  and matrix  $V_k$  comprises the  $k$  principal eigenvectors of  $dI - M^T M$ , and wherein matrix  $S = (dI - D)^{-1/2}$ , where  $D$  is the diagonal matrix comprising the  $k$  eigenvalues corresponding to the  $k$  principal eigenvectors of  $dI - MM^T$ .
12. (Currently Amended) The ~~method~~ system of claim 11 wherein computing an intermediate matrix  $M$  with respect to  $P$  is further with respect to a constant  $c$ .
- 13 (Currently Amended) The system of claim 1 wherein the page-grading engine grades the web pages as A-system for grading objects from an interconnected collection of weighted objects, the page-grading engine comprising:
- a description  $v$  of the weights of the objects, wherein non-zero entries of a vector indicative of the description  $v$  correspond at least to a favorites list associated with a user's web browser;
- a description  $P$  of the interconnection of the objects; and
- a processor ~~comprising an object-grading engine~~ for approximating an ideal grading function  $Q$  with an approximate function  $Q'$ , where applying ideal grading function  $Q$  to the description  $v$  produces ideal grades with respect to description  $P$  for every object in the interconnected collection of weighted objects, and for assigning at least one object the grade produced for that object by an application of  $Q'$  to  $v$ .

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**PATENT**  
**REPLY FILED UNDER EXPEDITED**  
**PROCEDURE PURSUANT TO**  
**37 CFR § 1.116**

14. (Original) The system of claim 13 further comprising a search engine in connection with the object-grading engine, wherein the object-grading engine grades objects passed from the search engine.

15-19 (Canceled)